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Highway Patrol

Retirement System

Actuarial Valuation

as of

July 1, 1990

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Hendrickson, Miller
& Associates, Inc.
ACTUARIAL CONSULTANTS

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Section I

Introduction

An actuarial valuation of the Highway Patrol Retirement System of the State of Montana has been completed as of July 1, 1990. This valuation was authorized by the Public Employees' Retirement Board under Section 19-6-202, MCA. The purpose of the valuation was to determine the financial position of the fund, the normal cost, and the unfunded accrued liability based upon present and prospective assets and liabilities of the system as of July 1, 1990.

Section II presents an analysis of the results of the actuarial valuation. The numerical findings and membership data supporting this analysis are shown in Section III.

In conducting the actuarial valuation, certain assumptions were made as to the future experience of the system. A summary and discussion of each of the assumptions is contained in Section IV.

The valuation is based upon the Highway Patrol Retirement Act and incorporates all amendments as of July 1, 1990. A summary of the major provisions of the Act is contained in Section V.

Actuarial Certification

The results of the actuarial valuation shown in this report are based upon information provided by the Public Employees' Retirement Division regarding plan participants, plan assets and other matters. The values have been calculated on the basis of actuarial assumptions which, in my opinion, are appropriate for purposes of this valuation.

This valuation has been prepared in accordance with generally accepted actuarial principles and practices and, to the best of my knowledge, fairly reflects the actuarial position of the Highway Patrol Retirement System as of July 1, 1990.

Alton P. Hendrickson
Member, American Academy
of Actuaries

Section II

Analysis of Valuation

Results of Valuation

An actuarial valuation has been conducted as of July 1, 1990 for the Highway Patrol Retirement System. This valuation has determined that the percent of each member's compensation required to fund the benefits as they accrue in the future is 21.85%. The aggregate contribution rate of 36.50% allows 14.65% of compensation to be applied toward the unfunded past service liability. This amount is sufficient to amortize the unfunded past service liability over a period of 31.97 years. The required funding period has decreased from 36.65 years in 1988.

A schedule has been prepared which will amortize the liabilities as of July 1, 1984, July 1, 1986, and July 1, 1988 over the remaining periods of 34 years, 36 years, and 38 years, respectively. The system had an actuarial gain -$2,811,993 as of July 1, 1990, which will be amortized over a 40-year period. The total contribution rate required to meet this schedule is 35.81% of compensation. This is an decrease over the 1988 rate of 36.50%. These rates are illustrated on Schedule 4.

Valuation of Assets

The improvement in the actuarial position of the Highway Patrol Retirement System was due largely to the handling of the market value gain in assets. Prior to 1988, assets were based upon the cost value. In order to better recognize the actual financial position of the funds, the valuation now recognizes market value gain. To smooth the year to year fluctuations, each year's gain or loss is recognized over a six year period. This means that 1/6 of the gain or loss is recognized the first year, with an additional 1/6 recognized each year thereafter, until the full amount is recognized after six years. The table below illustrates this valuation:

Market Value as of 6/30/90	$27,514,856	
Cost Value as of 6/30/90	$25,630,267	
1990 Market Gain	36,358	x 1/6
1989 Market Gain	948,664	x 1/3
1988 Market Gain	-318,546	x 1/2
1987 Market Gain	-358,316	x 2/3
1986 Market Gain	1,437,513	x 5/6
Prior Market Gain	138,916	
Adjusted Market Value	$26,891,241	

Actuarial Assumptions

The actuarial assumptions used in the valuation as of July 1, 1988 were continued in this valuation. A review of the system's data and experience did not reveal any deviations which warranted a change.

Summary of Data

The membership increased during the biennium from 187 active members to 195. The average member is age 40, was employed at age 27 and has completed 13.4 years of service.

The average annual compensation increased slightly from $26,214 to $26,515. The total annual payroll is $2,247,790.

The number of members receiving benefits grew from 164 in 1988 to 182 in 1990. The average retiree is age 63 and retired at age 51 with 24 years of service. The average retirement benefit is $844, which increased from $762 in 1988.

Conclusion

Based upon the results of this valuation, the Highway Patrol Retirement System is actuarially sound. The accrued liability of the system grew by $4.6 million during the biennium. This was more than offset by a $5.7 million increase in the system's assets.

Section III

Schedule 1

Highway Patrol Retirement System

Normal Cost Allocation

(1)	Normal Cost Contribution Rate		
	(a) Retirement		18.99%
	(b) Death		0.69
	(c) Disability		1.69
	(d) Vested		0.12
	(e) Withdrawals		0.36
	(f) Total Rate		21.85%
(2)	Present Value of Future Salaries Of Current Members	$	42,025,320
(4)	Present Value of Future Normal Costs For Current Members (1(f) * (2))	$	9,182,532

Schedule 2

Highway Patrol Retirement System

Present Value of Benefits

(1)	Present Value of Benefits - Inactive Members	
	(a) Retirement	$ 21,719,866
	(b) Death	1,192,405
	(c) Disability	1,264,291
	(d) Vested	206,923
	(e) Withdrawals	7,325
	(f) Total Inactive	$ 24,390,810
(2)	Present Value of Benefits - Active Members	
	(a) Retirement	$ 28,757,002
	(b) Death	626,837
	(c) Disability	1,479,516
	(d) Vested	114,309
	(e) Withdrawals	218,635
	(f) Total Active	$ 31,196,299
(3)	Total Liabilities	$ 55,587,109

Schedule 3

Highway Patrol Retirement System

Liability Allocation and Statutory Funding

(1) Unfunded Past Service Liability		
(a) Present Value of Benefits	$	55,587,109
(b) Present Value of Future Normal Costs	$	9,182,532
(c) Fund Assets	$	26,891,241
(d) Unfunded Liability (a)-(b)-(c)	$	19,513,336
(2) Contribution Rates Amortized over 31.97 Years		
(a) Present Value of Salaries During Next 31.97 Years	$	133,196,821
(b) Unfunded Contribution Rate 1(d)/2(a)		14.65%
(c) Normal Cost Rate (Schedule 1)		21.85
(d) Statutory Funding Rate		36.50%

Schedule 4

Highway Patrol Retirement System

Unfunded Liability Amortization Schedule

(1) Biennial Unfunded Past Service Liability Accounts

1984 Liability Account as of 7/1/88	$ 12,223,378
Interest Charge on Liability Account	2,033,970
Contributions Applied to Liability	963,276
Interest Credit on Contributions	74,290
1984 Liability Account as of 7/1/90	$ 13,219,782
1986 Liability Account as of 7/1/88	$ 10,224,092
Interest Charge on Liability Account	1,701,289
Contributions Applied to Liability	805,720
Interest Credit on Contributions	62,139
1986 Liability Account as of 7/1/90	$ 11,057,522
1988 Liability Account as of 7/1/88	$ -1,804,850
Interest Charge on Liability Account	-300,327
Contributions Applied to Liability	-142,233
Interest Credit on Contributions	-10,969
1988 Liability Account as of 7/1/90	$ -1,951,975

(2) Actuarial Gain/Loss

Current Unfunded Liability (Schedule 3)	$ 19,513,336
Less 1984 Liability Account	13,219,782
Less 1986 Liability Account	11,057,522
Less 1988 Liability Account	-1,951,975
1990 Liability Account as of 7/1/90	$ -2,811,993

(3) Required Contribution Rate

Normal Cost Rate (Schedule 1)	21.85%
Rate to Fund 1984 Liability Over 34 Years	9.45
Rate to Fund 1986 Liability Over 36 Years	7.57
Rate to Fund 1988 Liability Over 38 Years	-1.28
Rate to Fund 1990 Liability Over 40 Years	-1.78
Contribution Rate for 40-Year Schedule	35.81%

Schedule 5

Highway Patrol Retirement System

Comparison of Valuations

		1988	1990
(1)	Unfunded Past Service Liability		
	(a) Present Value of Benefits	$50,304,195	$55,587,109
	(b) Present Value of Future Costs	$ 8,308,170	$ 9,182,532
	(c) Fund Assets	$21,202,840	$26,891,241
	(d) Unfunded Liability	$20,793,185	$19,513,336
(2)	Amortization Period and Contribution Rates		
	(a) Years for Amortization	38.50	31.97
	(b) Unfunded Contribution Rate	14.696%	14.65%
	(c) Normal Cost Rate	21.804	21.85
	(d) Statutory Funding Rate	36.500%	36.50%
	(e) Amortization Schedule Rate*	37.059%	35.81%
(3)	Active Members		
	(a) Number of Members	182	195
	(b) Annual Payroll	$ 4,755,414	$ 5,170,508
	(c) Average Annual Salary	$ 26,129	$ 26,515
(4)	Inactive Members		
	(a) Number of Retired	144	154
	(b) Number of Disabled	8	10
	(c) Number of Survivors	15	18
	(d) Number of Vested Deferred	0	2
	(e) Annual Benefits	$ 1,505,208	$ 1,759,767
	(f) Average Monthly Benefit	$ 751	$ 806

* Rate required to amortize each year's new liabilities over 40 years.

Schedule 6

Table 1

Highway Patrol Retirement System

Number of Active Members

Years of Service	Member's Age									
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	Total
0-4	3	24	17	7	2					53
5-9		2	9	5	5					21
10-14				12	7	3				22
15-19				4	34	4	5			47
20-24					6	21	8			35
25-29						5	8		1	14
30-34								1	1	2
35-39									1	1
40-UP										
Total	3	26	26	28	54	33	21	1	3	195

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Table 2

Highway Patrol Retirement System

Average Salaries of Active Members

Years of Service	Member's Age									
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	Total
0-4	20937	21130	21451	21510	22320					21317
5-9		22932	23470	24406	24590					23908
10-14				26002	28178	27888				26951
15-19				30299	28734	29453	28654			28920
20-24					29246	29760	31157			29991
25-29						30951	29979		33361	30568
30-34								33645	30623	32135
35-39									44538	44538
40-UP										
Total	20937	21269	22150	25208	28097	29733	30113	33645	36174	26515

Table 3

Highway Patrol Retirement System

Number of Vested Inactive Members

Years of Service	Member's Age									
	20-25	25-29	30-34	35-39	40-44	45-49	50-54	55-59	OVER 60	Total
0-4										
5-9									1	1
10-14										
15-19						1				1
20-24										
25-29										
30-34										
35-39										
40-UP										
Total						1			1	2

Table 4

Highway Patrol Retirement System

Number of Retired Members

Member's Service	Recipient's Age									
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	Total
0-4										
5-9				1			1			2
10-14			4	1	1	2				8
15-19				1	2					3
20-24	2	8	13	16	6	7	3	5	10	70
25-29		1	5	18	4	6	7	1	8	50
30-34			1	6	5	3		1	2	18
35-39				1	1					2
40-UP						1				1
Total	2	9	23	44	19	19	11	7	20	154

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Table 5

Highway Patrol Retirement System

Average Benefits of Retired Members

Member's Service	Recipient's Age									
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	Total
0-4										
5-9				470			393			432
10-14			181	152	223	241				198
15-19				174	224					207
20-24	1067	1005	841	787	634	670	520	432	458	721
25-29		1274	1260	1096	984	824	682	593	618	930
30-34			1563	1538	1590	1151		893	741	1365
35-39				1947	1410					1679
40-UP						1966				1966
Total	1067	1035	849	1007	935	818	612	521	551	844

Table 6

Highway Patrol Retirement System

Number of Disabled Members

Member's Service	Recipient's Age									
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	Total
0-4	1									1
5-9	1	1							-	2
10-14					1					1
15-19		1		1					1	3
20-24		1	1						1	3
25-29										
30-34										
35-39										
40-UP										
Total	2	3	1	1	1				2	10

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Table 7

Highway Patrol Retirement System

Average Benefits of Disabled Members

Member's Service	Recipient's Age									
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	Total
0-4	509									509
5-9	804	699								752
10-14					456					456
15-19		1072		584					383	680
20-24		1153	1142						587	961
25-29										
30-34										
35-39										
40-UP										
Total	657	975	1142	584	456				485	739

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Table 8

Highway Patrol Retirement System

Number of Survivors

Member's Service	Recipient's Age									
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	Total
0-4										
5-9	3								1	4
10-14									1	1
15-19									3	3
20-24		1						1	5	7
25-29						1			2	3
30-34										
35-39										
40-UP										
Total	3	1				1		1	12	18

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Table 9

Highway Patrol Retirement System

Average Benefits of Survivors

Member's Service	Recipient's Age									
	< 45	45-49	50-54	55-59	60-64	65-69	70-74	75-79	Over 80	Total
0-4										
5-9	353								388	362
10-14									583	583
15-19									458	458
20-24		1072						474	465	553
25-29						891			570	677
30-34										
35-39										
40-UP										
Total	353	1072				891		474	484	517

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Section IV

Actuarial Funding Method

The true cost of the Highway Patrol Retirement System will be determined by its future experience. In determining the financial requirement of the fund, certain assumptions were made as to the expected future experience. This section summarizes the funding method applied as well as the basic assumptions used.

Any variations in the actual experience of the fund from those assumed in this valuation may cause changes in the projected future costs of the fund. It is therefore necessary that the actuarial assumptions be reviewed from time to time with adjustments as experience warrants. It is also important that regular valuations be performed to determine the financial effect of variations between the actual and assumed experience.

The assumptions shown below were based upon the past experience of the fund together with the projections as to future experience.

The method of funding employed is commonly referred to as the entry age normal cost method. This method establishes a normal cost of each fund as well as an unfunded accrued liability. The normal cost is the level percentage of total salaries required to fund the benefits, assuming this percentage has been contributed since each member's entry into the fund.

The unfunded accrued liability represents the excess of the present value of total liabilities over the present assets of the fund and the present value of expected future contributions for the normal cost.

In order to maintain the fund on an actuarially sound basis, the rate of contribution should be such as to meet the normal cost in addition to making progress towards the amortization of the unfunded liability.

Discussion of Actuarial Assumptions

Mortality Rates

The mortality rates for males and females are based upon the 1983 Group Annuity Mortality Table, and apply to both active members and those receiving benefits.

Disability Rates

The disability rates for males and females are based upon the 1983 Disability Table.

Withdrawal Rates

The withdrawal rates are based upon the actual experience of the system as determined in the 1987 withdrawal experience study.

Salary Scale

The rates of salary increase are based upon an assumed compounded growth rate of 6.5% per annum.

Investment Earnings

It was assumed that the investment earnings would be 8% compounded annually.

Administrative Expenses

It was assumed that the system would incur no administrative expenses beyond those provided by investment earnings in excess of 8%.

Termination Benefits

It was assumed that all members terminating with less than ten years of service would receive an immediate withdrawal of their member contributions with interest. It was further assumed that members with ten or more years of service would select the most advantageous benefits under the given assumptions.

Withdrawal Rates

The withdrawal rates illustrated below reflect the turnover experienced by the Highway Patrol Retirement System.

Age	Withdrawals Per 10,000 Active Members
25	592
30	336
35	211
40	195
45	104
50	0

Salary Scale

The salary increases are based upon an assumed compounded growth rate of 6.5% per annum.

Investment Earnings

Future investment earnings are assumed to be 8% compounded annually.

Administrative Expenses

It was assumed that the administrative expenses would be recovered by investment earnings in excess of 8%.

Section V

Summary of Benefits and Contributions

Effective Date -	July 1, 1945
Member Contributions -	7.59% of salary.
State Contributions -	26.75% of patrol officers' salaries.
Retirement Benefit -	Minimum service: 20 years Minimum age: a) if first employed on or before July 1, 1985, none b) if first employed after July 1, 1985, age 50. Normal form: Life payments to the member and, upon the member's death, continuing to the surviving spouse. In the event there is no surviving spouse, or the spouse subsequently dies, payments continue to dependent children, if any. Benefit: 2% of the average monthly salary during the highest 36 consecutive months of earnings times years of service.
Disability Benefit -	Service disability: 50% of the average monthly salary during the highest 36 consecutive months of earnings. Nonservice disability: Actuarial equivalent of the accrued retirement benefit.
Death Benefit -	Service death: 50% of the average monthly salary during the highest 36 consecutive months of earnings less any amounts payable under the Workers' Compensation Act. Nonservice death: Actuarial equivalent of the accrued retirement benefit based upon a retirement age of 60.

Termination Benefit -	Prior to completion of 5 years of service, return of accumulated contributions without interest if for cause or with interest if voluntary. After completion of 5 years of service, either return of accumulated contributions with interest or the actuarial equivalent of the accrued retirement benefit based upon a retirement age of 60.
Benefit Adjustments -	Subject to certain limitations, retired members and their beneficiaries are entitled to benefits not less than 2% multiplied by the member's years of service multiplied by the current base salary received by a probationary highway patrolman.